REMARKS

This response is being filed after the shortened three-month statutory period set for responding to the Office Action mailed on September 13, 2001. Therefore, a petition and a fee for an extension of time are enclosed herewith.

Hereinafter, the claims that are pending prior to the entry of the amendments in this response are called "currently pending claims." This response amends currently pending Claims 1-3, 7, 9, 11, 13, 15, 17, and 19, and adds new Claims 21-38. Upon amendment, the above-identified U.S. patent application will have seven independent claims (amended Claims 1, 9, 11, 13, 15, 17, and 19) and 38 total claims (amended Claims 1-3, currently pending Claims 4-6, amended Claim 7, currently pending Claim 8, amended Claim 9, currently pending Claim 10, amended Claim 11, currently pending Claim 12, amended Claim 13, currently pending Claim 14, amended Claim 15, currently pending Claim 16, amended Claim 17, currently pending Claim 18, amended Claim 19, currently pending Claim 20, and new Claims 21-38). The Applicants previously paid for three independent claims and 20 total claims. Therefore, a fee is due for 4 excess independent claims and 18 excess total claims; and a check for this fee is enclosed herewith.

Support for amending currently pending Claims 1-3 and 7 can be found in, inter alia, the originally filed versions of Claim 1-3 and 7, respectively.

This response amends currently pending Claims 9, 11, 13, 15, 17, and 19 to incorporate the limitations of currently pending Claim 1.

Support for new Claims 21, 27, 30, 33, and 36 can be found in, inter alia, the originally filed version of Claim 2. Support for new Claims 22, 28, 31, 34, and 37 can be found in, inter alia, the originally filed version of Claim 3. Support for new Claims 23, 29, 32, 35, and 38 can be found in, inter alia, the originally filed version of Claim 3. Support for new Claim 24-26 can be found in, inter alia, the originally filed version of Claim 20.

In items 1-2 on page 2 of the outstanding Office Action, the Examiner rejects currently pending Claims 1-6 for allegedly being anticipated by Leslie G. S. Brooker, et al.'s U.S. Patent No. 2,882,158. This rejection should be withdrawn because amended Claim 1 is nonobvious over the prior art.

In item 3 on page 2 of the outstanding Office Action, the Examiner rejects currently pending Claims 7 and 8 because the specification allegedly lacks enablement under 35 U.S.C. § 112, first paragraph. The Applicants respectfully traverse this rejection. Furthermore, the rejection in item 3 should be withdrawn because amended Claim 7 and currently pending Claim 8 are enabled by the originally filed specification.

In item 4 on page 3 of the outstanding Office Action, the Examiner indicates that currently pending Claims 9-20 would be allowed if currently pending Claims 9, 11, 13, 15, 17, and 19 were amended to incorporate the limitations of currently pending Claim 1. Therefore, this response amends currently pending Claims 9, 11, 13, 15, 17, and 19 to incorporate the limitations of currently pending Claim 1.

In item 5 on page 3 of the outstanding Office Action, the Examiner requests copies of some of the documents that were submitted to the U.S. Patent and Trademark Office (USPTO) with an Information Disclosure Statement (IDS) that was filed with a Certificate of

Mailing dated July 29, 1999. A copy of this July 29, 1999 IDS (with the Certificate of Mailing, a Form PTO-1449 (modified), and a copy of each document that is listed in the Form PTO-1449 (modified)) is enclosed herewith. The enclosed copy of the July 29, 1999 IDS includes copies of the documents that are requested by the Examiner in item 5 of the outstanding Office Action.

According to our records, the July 29, 1999 IDS, which included a Form PTO-1449 (modified) and a copy of each document that is listed in the Form PTO-1449 (modified), was timely filed with a Certificate of Mailing dated July 29, 1999. Because the July 29, 1999 IDS was filed before the issuance of the first Office Action on the merits, the Examiner should consider on the merits all of the documents that are listed in the Form PTO-1449 (modified). Therefore, the Examiner is respectfully requested to sign and initial the enclosed copy of the Form PTO-1449 (modified) to indicate that he has considered on the merits all of the documents that are listed in the Form PTO-1449 (modified). A copy of the signed and initialled Form PTO-1449 (modified) should then be sent to the Applicants.

Because the July 29, 1999 IDS was timely filed before the issuance of the first Office Action on the merits, the Applicants believe that no official fees should be required for the Examiner to consider on the merits all of the documents that are listed in the Form PTO-1449 (modified) from July 29, 1999 IDS. If any official fees are required for the Examiner to consider on the merits all of the documents that are listed in the Form PTO-1449 (modified) from July 29, 1999 IDS, then the Commissioner is authorized to charge Deposit Account No. 12-0415 $180.00 (or any other required amount), which is the fee set forth in 37 C.F.R. § 1.97(c); and all of the documents that are listed in the Form PTO-1449 (modified) from July 29, 1999 IDS should be fully considered on the merits, in accordance with 37 C.F.R. § 1.97(d).

Finally, to correct a typographical error, this response amends page 12 of the specification to indicate that the following article was published in 1977, rather than in 1997: E. Piers, J.R. Grierson, *J. Org. Chem.*, 42, 3755-3757.

In view of the foregoing, favorable reconsideration of the amended application is respectfully requested. It is submitted that the claims of record are in condition for allowance. Allowance of the claims at an early date is solicited.

This response amends currently pending Claims 1-3, 7, 9, 11, 13, 15, 17, and 19, and adds new Claims 21-38. The amendments and additions that are described in the preceding sentence were done to claim the scope of the invention that the Applicants elect to claim and were not necessarily done to overcome the prior art, to overcome rejections under 35 U.S.C. § 112, or to overcome any other rejections or objections. The amendments and additions that are described in the first sentence of this paragraph shall not be considered necessary to overcome the prior art, shall not be considered necessary to overcome rejections under 35 U.S.C. § 112, and shall not be considered necessary to overcome any other rejections or objections.

The Applicants reserve the right to seek protection for any unclaimed subject matter either subsequently in the prosecution of the present case or in a divisional or continuation application.

The Commissioner is authorized to charge any additional fees which may be required or credit overpayment to Deposit Account No. 12-0415; and, in particular, if this response is not timely filed, then the Commissioner is authorized to treat this Response as including a petition to extend the time period pursuant to 37 C.F.R 1.136(a) requesting an extension of time of the number of

months necessary to make this response timely filed and the petition fee due in connection therewith may be charged to deposit account No. 12-0415.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Box DAC, Washington, D.C., 20231 on

February 13, 2002
(Date of Deposit)

JOHN PALMER
(Name of Applicant, Assignee or Registered Representative)

(Signature)

2-13-02
(Date)

Respectfully submitted,

John Palmer
Reg. No. 36,885
LADAS & PARRY
5670 Wilshire Boulevard
Suite 2100
Los Angeles, California 90036
(323) 934-2300

Enclosures: Appendices A, B, C, D, and E

A copy of a July 29, 1999 Information Disclosure Statement with a copy of a Form PTO-1449 (modified) and a copy of each document that is listed in the Form PTO-1449 (modified)

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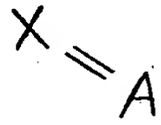
APPENDIX B

Re: U.S. Patent Application No. 09/285,937

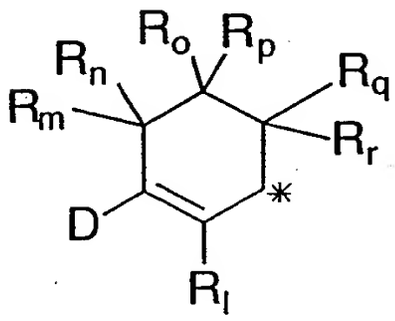
Our Ref.: 616758-3/JP

Claim 1. (amended once) A compound having a formula A:

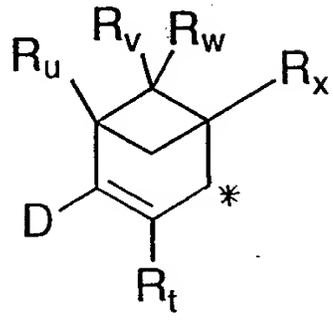


(formula A)

wherein X is selected from the group consisting of



and



wherein D is selected from the group consisting of NR_aR_b, OR_a, SR_a, PR_aR_b, and R_c;

wherein A is selected from the group consisting of:

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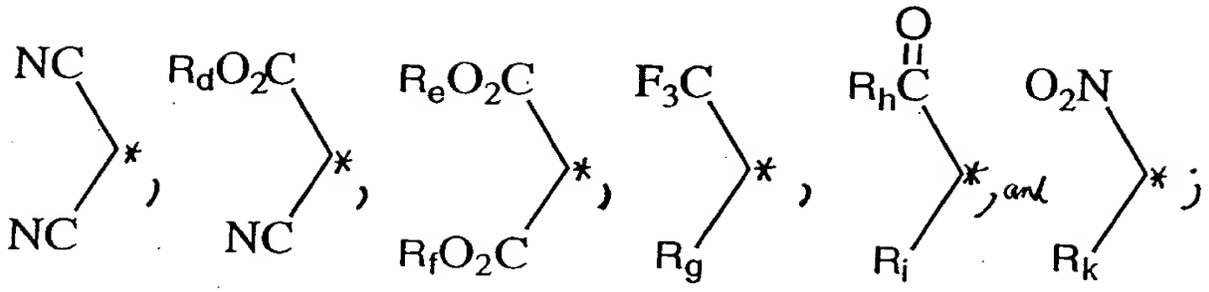

wherein R_a, R_b, and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_d, R_e, R_f, R_l, R_m, R_n, R_o, R_p, R_q, R_r, R_s, R_t, R_u, R_v, R_w, and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_g, R_h, R_i, and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; an aryl group; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; $-CO_2R_d$; and $-COR_d$;

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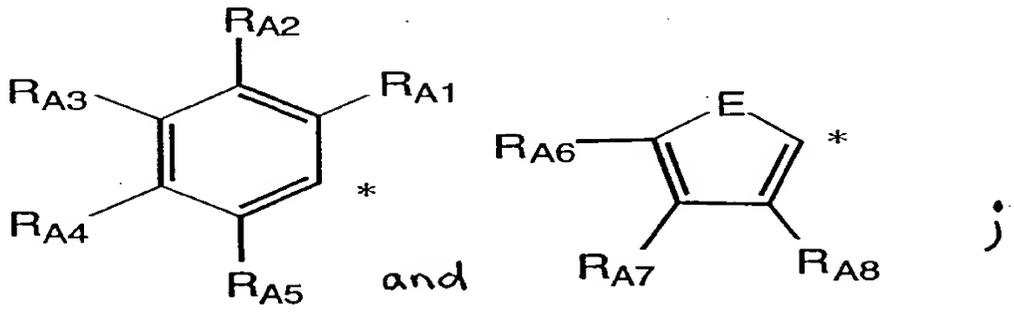
wherein each aryl group is optionally independently selected from the group consisting of



;

wherein R_{A1}, R_{A2}, R_{A3}, R_{A4}, R_{A5}, R_{A6}, R_{A7}, and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

wherein E is selected from the group consisting of S, O, and NR_s;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

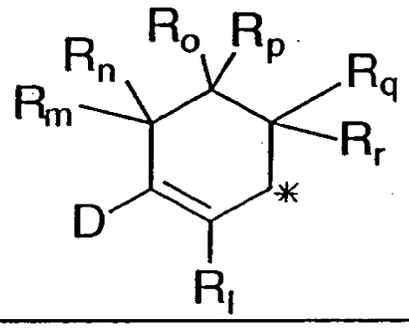
wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25; [and]

APPENDIX B

wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25; and

when: D is CH_3; R_m, R_n, R_q, and R_r are each H; R_o is H or CH_3; R_p is H or CH_3; and X is



)

then A is not C(CN)(CN).

Claim 2. (amended once) A compound as claimed in Claim 1, wherein R_l, R_m, R_n, R_o, R_p, R_q, R_r, R_t, R_u, R_v, R_w, and R_x are each H; wherein A is C(CN)(CN); and wherein D is R_y or OR_y, and wherein R_y is selected from the group consisting of the linear alkyl group, the branched alkyl group, the cyclic alkyl group, and the aryl group.

Claim 3. (amended once) A compound as claimed in Claim 1, wherein the compound is selected from the group consisting of

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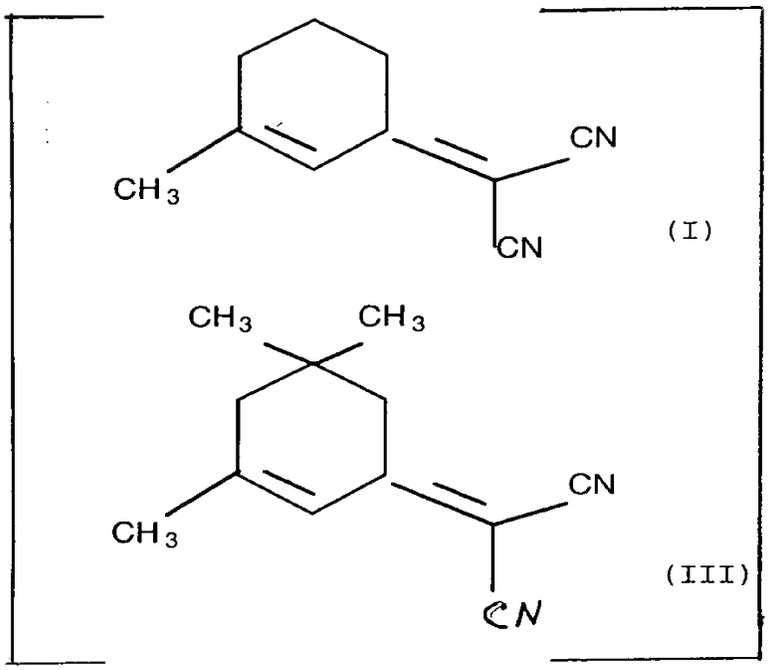
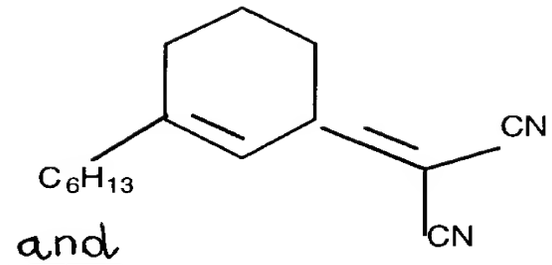


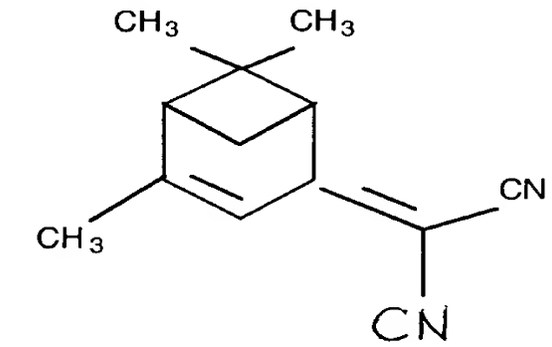
(I)



and

(II)

(III)



(IV)

Claim 7. (amended once) A liquid-crystal dopant [having] comprising the compound claimed in Claim 1, wherein the liquid-crystal dopant has: (1) at about 20-30°C an absorption loss in [the] a visible region of less than or equal to about 5%; [having] (2) at about 20-30°C a dielectric anistropy of greater than about 50; and (3) [having] at about 20-30°C a viscosity lower than about 50 [centi-poise] centipoise.

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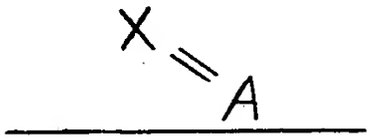
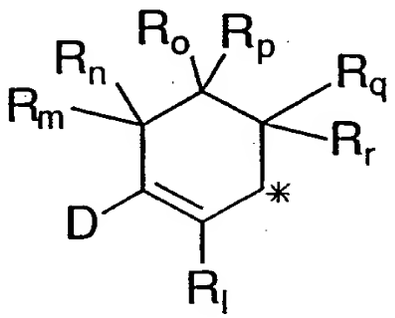
Claim 9. (amended once) A composition comprising a liquid-crystal mixture and a compound [as claimed in Claim 1.] having a formula A:

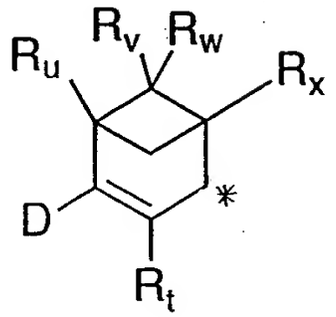


(formula A)

wherein X is selected from the group consisting of



and



;

wherein D is selected from the group consisting of NR_aR_b, OR_a, SR_a, PR_aR_b, and R_c;

~~wherein A is selected from the group consisting of:~~

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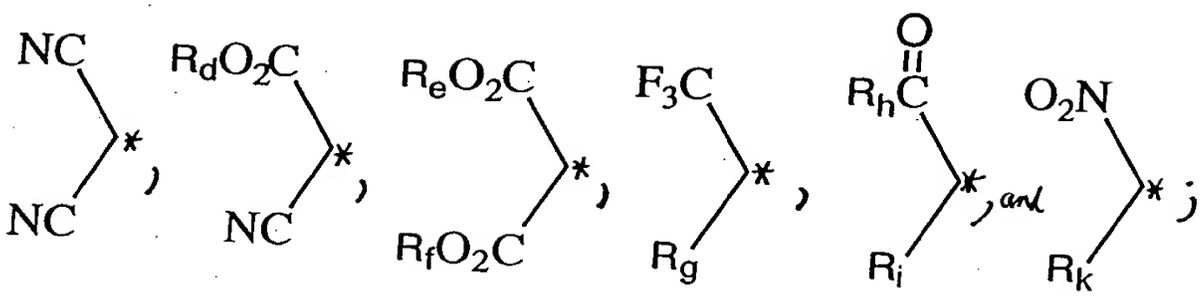

wherein R_a, R_b, and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_d, R_e, R_f, R_l, R_m, R_n, R_o, R_p, R_q, R_r, R_s, R_t, R_u, R_v, R_w, and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_g, R_h, R_i, and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; an aryl group; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; $-CO_2R_d$; and $-COR_d$;

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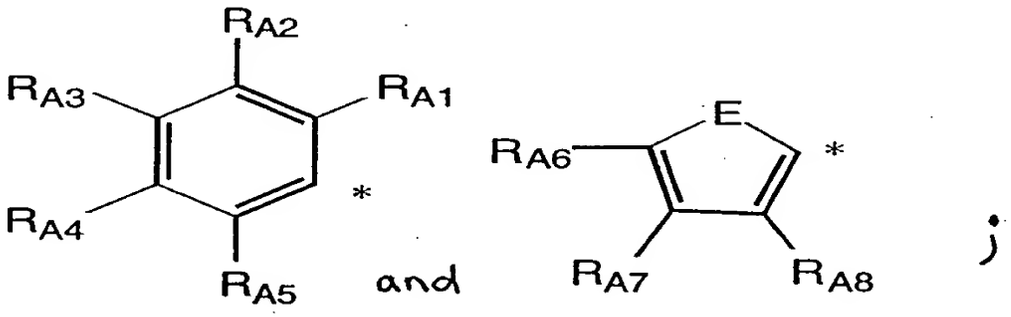
wherein each aryl group is optionally independently selected from the group consisting of



;

wherein R_{A1}, R_{A2}, R_{A3}, R_{A4}, R_{A5}, R_{A6}, R_{A7}, and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

wherein E is selected from the group consisting of S, O, and NR_S;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25; and

wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25.

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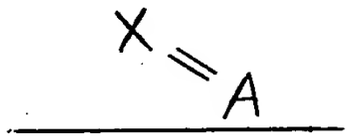
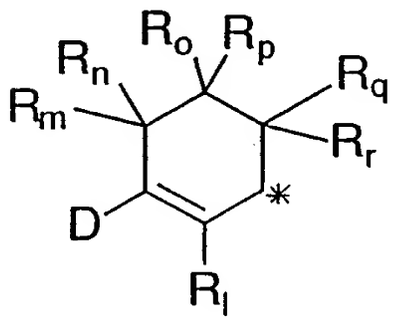
Claim 11. (amended once) A method for reducing an operation voltage of a liquid-crystal mixture, the method comprising adding [the compound claimed in Claim 1] to the liquid-crystal mixture[.] a compound having a formula A:

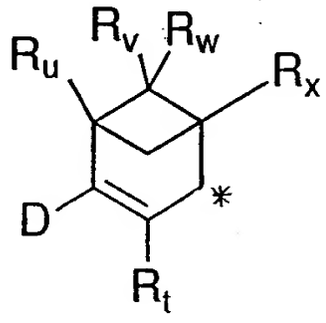


(formula A)

wherein X is selected from the group consisting of



and



;

wherein D is selected from the group consisting of NR_aR_b, OR_a, SR_a, PR_aR_b, and R_c;

wherein A is selected from the group consisting of:

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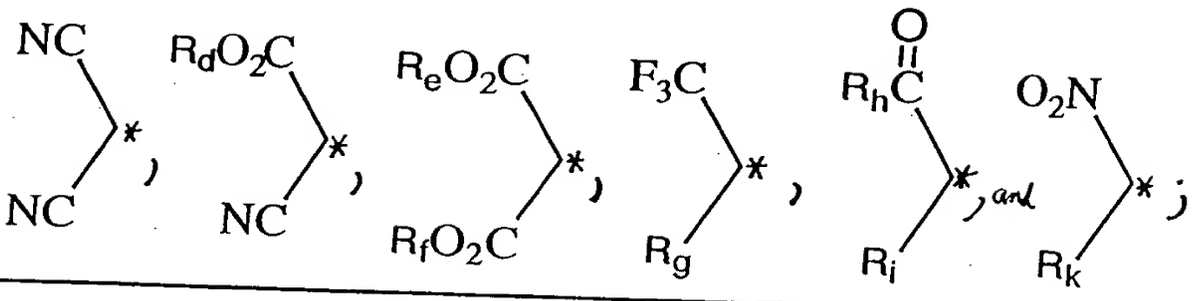

wherein R_a, R_b, and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_d, R_e, R_f, R_l, R_m, R_n, R_o, R_p, R_q, R_r, R_s, R_t, R_u, R_v, R_w, and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_g, R_h, R_i, and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; an aryl group; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; $-CO_2R_d$; and $-COR_d$;

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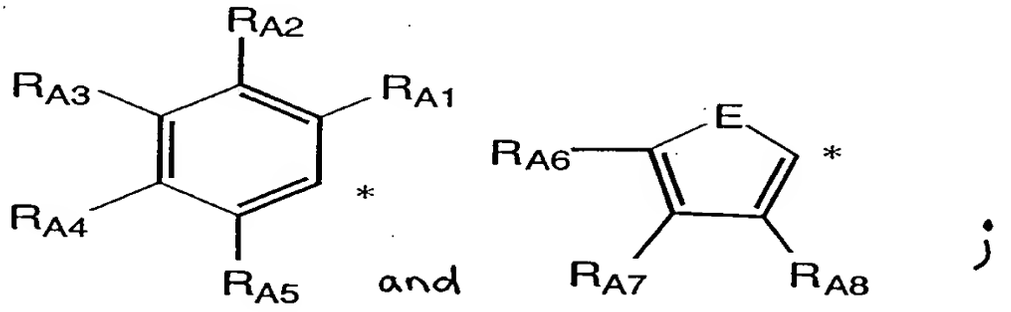
wherein each aryl group is optionally independently selected from the group consisting of



;

wherein R_{A1}, R_{A2}, R_{A3}, R_{A4}, R_{A5}, R_{A6}, R_{A7}, and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

wherein E is selected from the group consisting of S, O, and NR_S;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

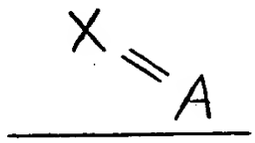
wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25; and

wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25.

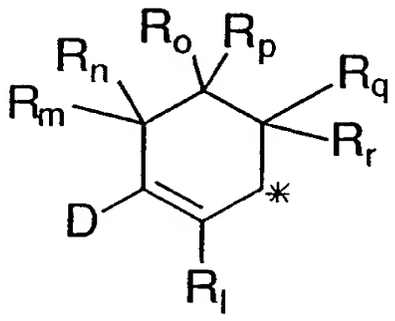
APPENDIX B

Claim 13. (amended once) A method for tuning a clearing temperature of a liquid-crystal mixture, the method comprising adding [the compound claimed in Claim 1] to the liquid-crystal mixture 1[.] a compound having a formula A:

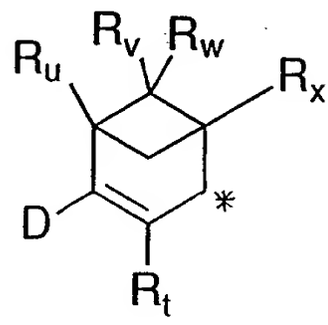


(formula A)

wherein X is selected from the group consisting of



and

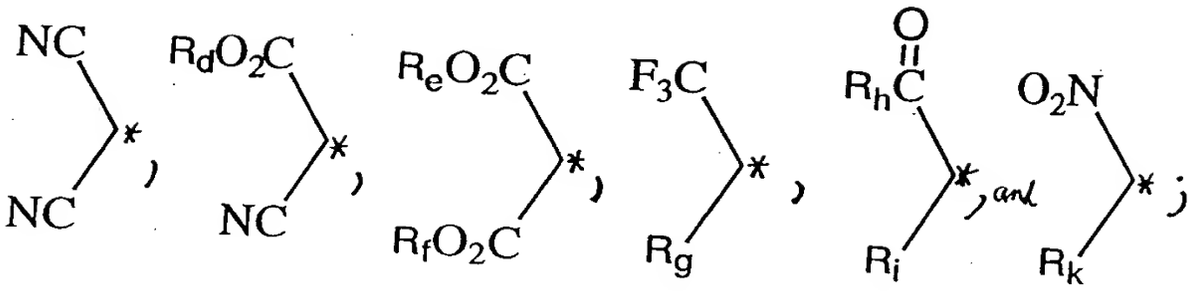


;

wherein D is selected from the group consisting of NR_aR_b, OR_a, SR_a, PR_aR_b, and R_c;

wherein A is selected from the group consisting of:

APPENDIX B



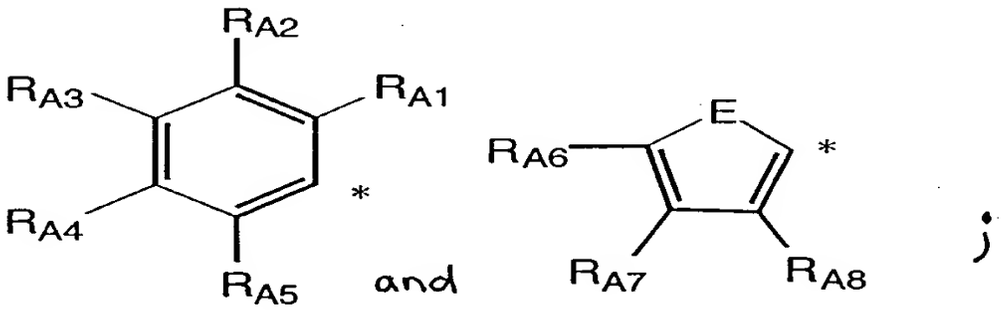
wherein R_a, R_b, and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_d, R_e, R_f, R_l, R_m, R_n, R_o, R_p, R_q, R_r, R_s, R_t, R_u, R_v, R_w, and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_g, R_h, R_i, and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; an aryl group; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; $-CO_2R_d$; and $-COR_d$;

APPENDIX B

wherein each aryl group is optionally independently selected from the group consisting of



;

wherein R_{A1}, R_{A2}, R_{A3}, R_{A4}, R_{A5}, R_{A6}, R_{A7}, and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

wherein E is selected from the group consisting of S, O, and NR_s;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

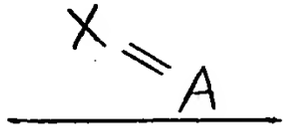
wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25; and

wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25.

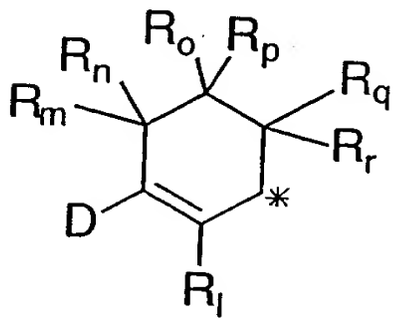
APPENDIX B

Claim 15. (amended once) A method for tuning birefringence of a liquid-crystal mixture, the method comprising adding [the compound claimed in Claim 1] to the liquid-crystal mixture [.] a compound having a formula A:

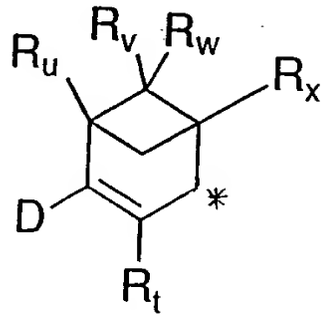


(formula A)

wherein X is selected from the group consisting of



and

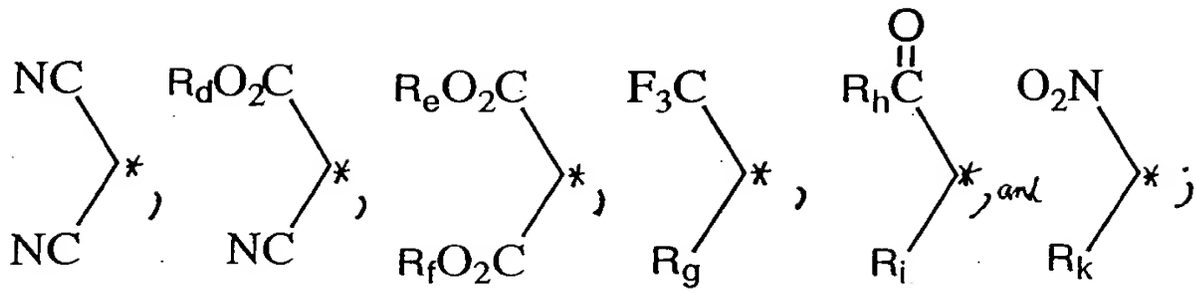


;

wherein D is selected from the group consisting of NR_aR_b, OR_a, SR_a, PR_aR_b, and R_c;

wherein A is selected from the group consisting of:

APPENDIX B

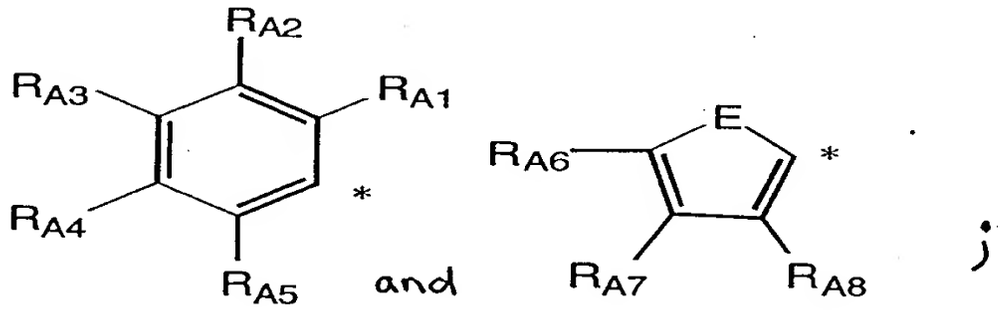


wherein R_a, R_b, and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_d, R_e, R_f, R_l, R_m, R_n, R_o, R_p, R_q, R_r, R_s, R_t, R_u, R_v, R_w, and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_g, R_h, R_i, and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; an aryl group; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; $-CO_2R_d$; and $-COR_d$;

wherein each aryl group is optionally independently selected from the group consisting of



;

wherein R_{A1}, R_{A2}, R_{A3}, R_{A4}, R_{A5}, R_{A6}, R_{A7}, and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

wherein E is selected from the group consisting of S, O, and NR_s;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

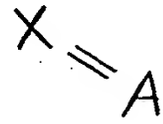
wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25; and

wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25.

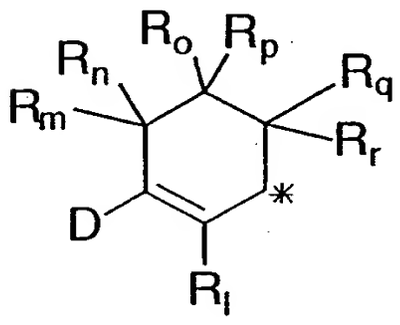
Claim 17. (amended once) A method for increasing a $\partial n/\partial T$ of a liquid-crystal mixture, the method comprising adding [the] a compound [claimed in Claim 1] to the liquid-crystal mixture to yield a resulting mixture[,]; wherein the resulting mixture at about 20-30°C has a $\partial n/\partial T$ larger than about 0.005, wherein n is a

refractive index of the resulting mixture and T is a temperature of the resulting mixture in °C; and wherein the compound has a formula A:

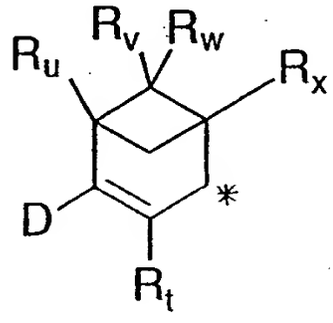


(formula A)

wherein X is selected from the group consisting of



and



;

wherein D is selected from the group consisting of NR_aR_b, OR_a, SR_a, PR_aR_b, and R_c;

wherein A is selected from the group consisting of:

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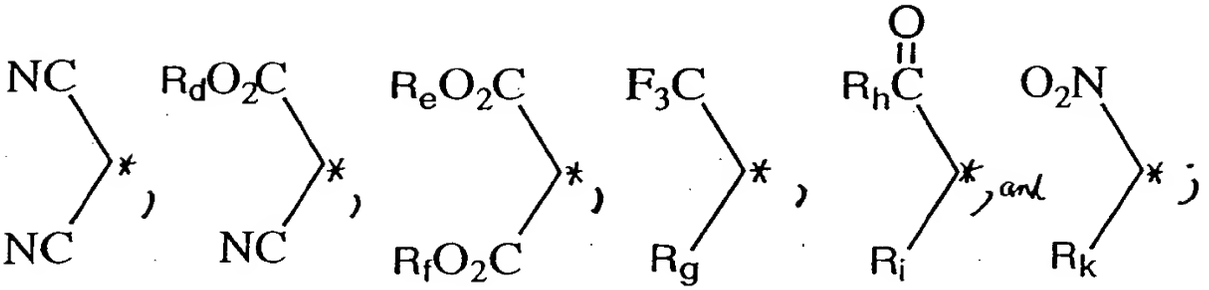

wherein R_a, R_b, and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_d, R_e, R_f, R_l, R_m, R_n, R_o, R_p, R_q, R_r, R_s, R_t, R_u, R_v, R_w, and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_g, R_h, R_i, and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; an aryl group; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; $-CO_2R_d$; and $-COR_d$;

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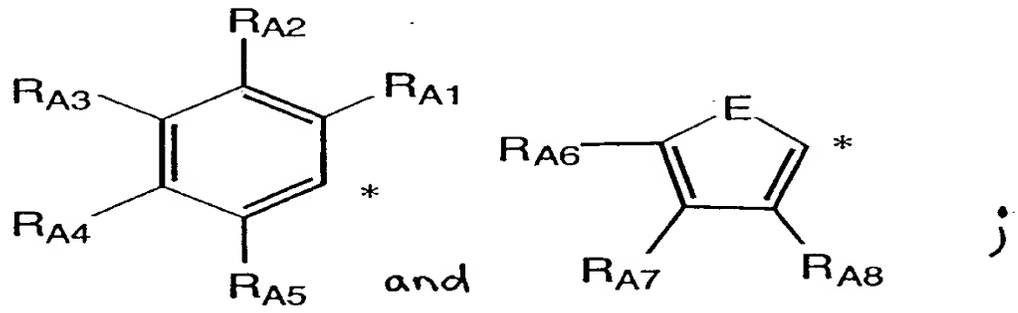
wherein each aryl group is optionally independently selected from the group consisting of



;

wherein R_{A1}, R_{A2}, R_{A3}, R_{A4}, R_{A5}, R_{A6}, R_{A7}, and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

wherein E is selected from the group consisting of S, O, and NR_S;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25; and

wherein γ is an integer that is greater than or equal to 0 and less than or equal to 25.

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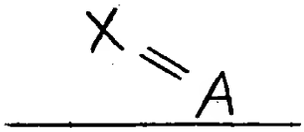
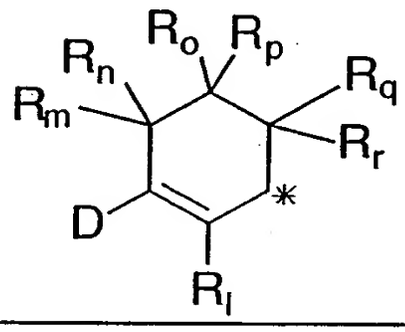
Claim 19. (amended once) A compound [as claimed in Claim 1, wherein] having a formula A:

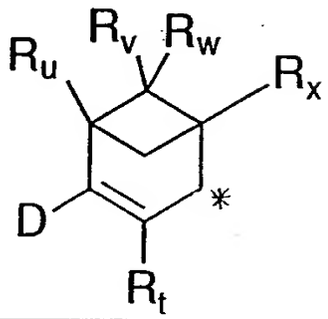


(formula A)

wherein X is selected from the group consisting of



and



;

wherein D is selected from the group consisting of NR_aR_b, OR_a, SR_a, PR_aR_b, and R_c;

wherein A is selected from the group consisting of:

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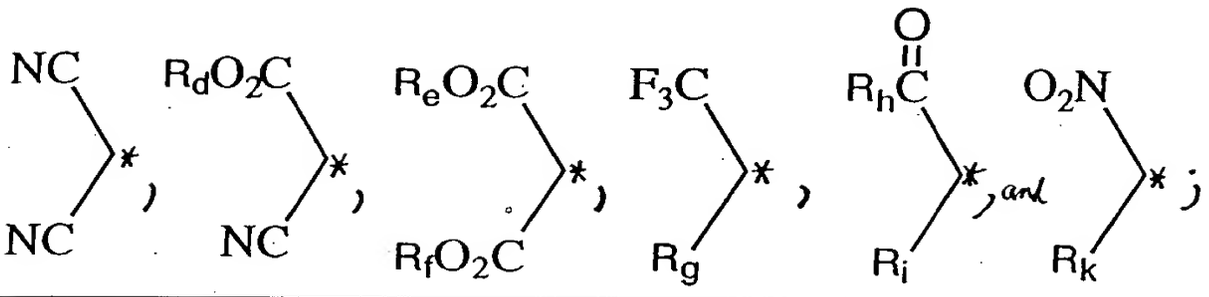

wherein R_a, R_b, and R_c are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_d, R_e, R_f, R_l, R_m, R_n, R_o, R_p, R_q, R_r, R_s, R_t, R_u, R_v, R_w, and R_x are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; and an aryl group;

wherein R_g, R_h, R_i, and R_k are the same or different and are each independently selected from the group consisting of: H; a linear, branched, or cyclic hydrocarbon group that is saturated or unsaturated; a linear, branched, or cyclic alkyl group; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta OR_{A1}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta NR_{A2}R_{A3}$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta CN$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Cl$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta Br$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta I$; $-(CH_2CH_2O)_\alpha-(CH_2)_\beta$-Phenyl; an aryl group; $-(CH_2)_\alpha(CF_2)_\gamma CF_3$; $-CO_2R_d$; and $-COR_d$;

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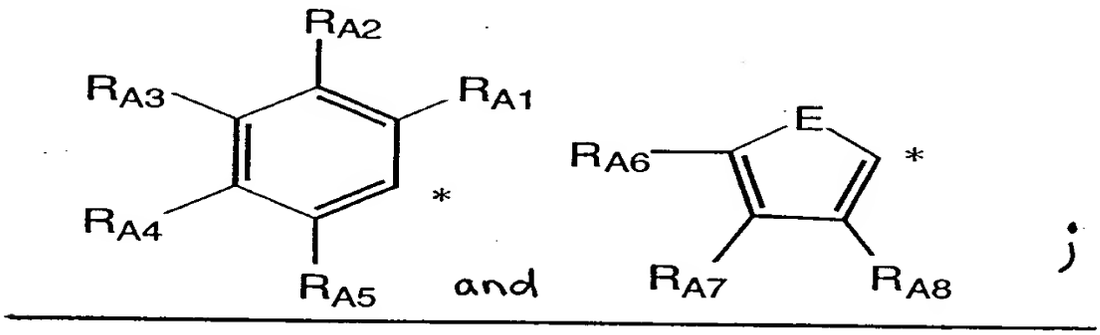
wherein each aryl group is optionally independently selected from the group consisting of



;

wherein R_{A1}, R_{A2}, R_{A3}, R_{A4}, R_{A5}, R_{A6}, R_{A7}, and R_{A8} are the same or different and are each independently selected from the group consisting of H, a linear alkyl group, a branched alkyl group, and a cyclic alkyl group;

wherein E is selected from the group consisting of S, O, and NR_S;

wherein the alkyl group is optionally substituted or unsubstituted and optionally includes up to 25 carbon atoms;

wherein α is an integer that is greater than or equal to 0 and less than or equal to 25;

wherein β is an integer that is greater than or equal to 0 and less than or equal to 25;